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Evaluation Of Irrigation Area Maintenance Budget Priority Determination Using The Analytical Hierarchy Process (AHP) Method

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ABSTRACT

Determining the criteria for allocating maintenance funds is a problem in itself in maintaining irrigation areas apart from the problem of limited funds. Determining the allocation of funds based only on the level of damage without considering the characteristics of each irrigation area can lead to imbalances in the field. In the problem of determining priorities, decision makers are faced with several criteria in giving priority to maintenance budgets in irrigation areas, one of which is in Sragen Regency. One approach that is widely used to solve this problem is the Analytical Hierarchy Process (AHP). The AHP analysis model can solve problems that combine quantitative and qualitative data. The aim of this research is to determine which irrigation areas have the highest priority for maintenance based on the criteria of level of urgency, productivity, area size, cost. The questionnaire method is used to obtain primary data through questionnaire data collection and literature study to obtain secondary data. There are 5 irrigation areas that are the object of research, namely: 1. Kedung Duren Winong Irrigation Area, 2. Kedung Song Irrigation Area, 3. Garut Irrigation Area, 4. Karanganom Irrigation Area, 5. Buduran Irrigation Area. The result is that the order of criteria that have the priority (level) that most influences the budget allocation for maintenance of irrigation areas is Urgency Level 46.6%, Planting Productivity 24.4%, Area Area 14.5%, Cost 14.5% and obtained the priority percentage for budget allocation maintenance of irrigation areas, namely the Buduran Irrigation Area at 23.7%, the Kedung Duren Winong Irrigation Area at 21.7%, the Kedung Song Irrigation Area at 20.6%, the Garut Irrigation Area at 19.5%, the Karanganom Irrigation Area at 14.4%.

Keywords: *Priority, Maintenance of Irrigation Areas, Analytical Hierarchy Process (AHP)*

Introduction

Development of the agricultural sector is the main priority of the Sragen Regency government. This is demonstrated by government programs that are focused on developing and improving irrigation supporting facilities and infrastructure. The amount of irrigation needed as a source of water for rice fields is very large when viewed from a large scale. Of the total 39,820 hectares of rice fields in Sragen Regency, the area of rice fields that is irrigated reaches 25,366 ha (63.70%), then the remaining 14,454 ha (36.29%) is rain-fed rice fields (DPUPR Sragen Regency, 2020). [1]

In the problem of determining priorities, decision makers are faced with several criteria in giving priority to the maintenance budget for irrigation areas in Sragen Regency. This is called MCDM (Multi Criteria Decision Making). Where the determination of a decision is based on many criteria which are prepared and processed in stages by considering the weight of each factor (Sumiyati, 2011). One approach that is widely used in solving MCDM problems is the Analytical Hierarchy Process (AHP). The AHP analysis model can solve problems that combine quantitative and qualitative data. [5]

Based on these temporary observations, the problem with determining budget priorities for maintaining irrigation funds in Sragen Regency is limited funds and assessment criteria. This can be seen in the budget determination in the five irrigation areas which are the objects of research. Determination of the maintenance budget so far has been carried out by the District DPUPR. Sragen only uses one assessment variable, namely the level of damage. Other variables or criteria such as level of urgency, land area, productivity and costs are not included in the assessment weighting. The government has set up a system for assessing and weighting irrigation network performance as outlined in PUPR Ministerial Regulation No. 12/PRT/M/2015 concerning Exploitation and Maintenance of Irrigation Networks. However, in practice, the assessment of the physical infrastructure performance index based on these regulations is generally carried out visually because there is no definite calculation in carrying out the assessment and weighting system. [7]

The budget allocation for maintenance funds in Sragen Regency for the five irrigation areas needs to be developed in a more appropriate model for calculating the budget allocation for irrigation maintenance costs. For this reason, a budget allocation calculation model based on a more precise method is needed. In this case, decision

making based on multi-criteria analysis needs to be applied in order to achieve the goal of more targeted and optimal use of funds as expected.

The identification and formulation of the problem in this research can be described as follows:

- How to assess the criteria and rank the order of priority based on the criteria of level of urgency, productivity, service area and costs in determining the budget allocation for irrigation area maintenance costs in Sragen Regency using the Analytical Hierarchy Process (AHP) method ?
- How to decide on budget allocation for maintenance costs for the most priority irrigation areas in Sragen Regency using the Analytical Hierarchy Process (AHP) method?
- How does it compare to just using damage level criteria for maintaining irrigation areas that have been used in Sragen Regency?

The objectives to be achieved in this research are as follows:

- a. Assessing the criteria and ranking the priority order based on the criteria of level of urgency, productivity, service area and costs in determining the budget allocation for irrigation area maintenance costs in Sragen Regency using the Analytical Hierarchy Process (AHP) method.
- b. Deciding the budget allocation for maintenance costs in the most priority irrigation areas in Sragen Regency using the Analytical Hierarchy Process (AHP) method.
- c. Comparing using only damage level criteria for maintaining irrigation areas that have been used in Sragen Regency.

Research Methods

The research approach uses a case study model. The problem raised in this research is determining the allocation of irrigation maintenance costs in Sragen Regency. The solution to the problem offered regarding determining irrigation maintenance budget priorities is using the AHP analysis technique. This analysis represents all complex problems in a multilevel structure.

Data analysis techniques were carried out to determine priorities for budget allocation for irrigation area maintenance. The data was analyzed using a mathematical approach using matrix calculations by processing, cumulative and tabulating questionnaire data. The next data analysis technique is the Analytical Hierarchy Process (AHP) using Microsoft Exxel Window 2010 software to determine the priority scale for the irrigation area maintenance budget in Sragen Regency. The following is an overview of the hierarchical structure of determining the problem of determining priorities for budget allocation for DI maintenance costs in Sragen Regency.

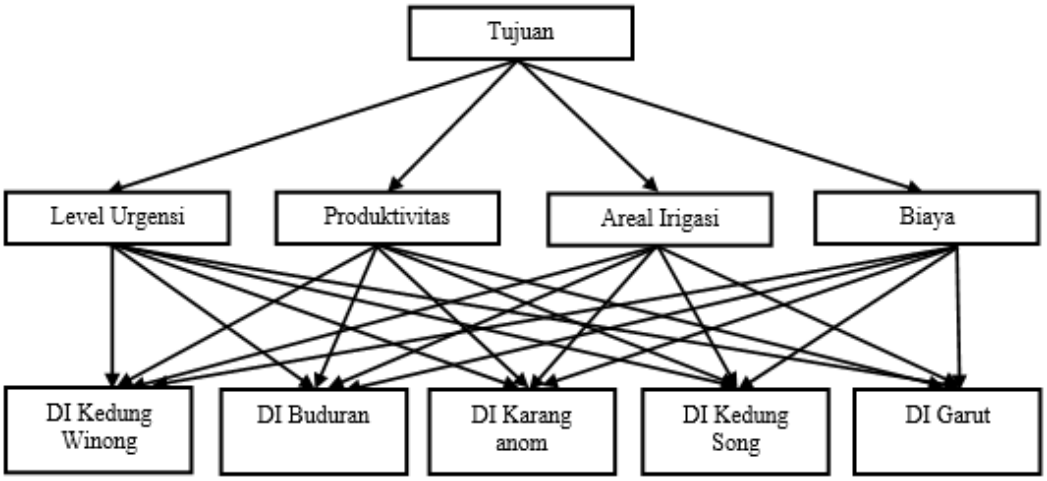

Figure 1 . Hierarchical Structure for Solving Irrigation Area Budget Allocation Problems

In order for research to run in a directed and systematic manner, a research work flow is needed. The systematic research flow diagram can be seen in the following image.

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Results and Discussion

Physical Conditions of Irrigation Areas

In carrying out the analysis, the Sragen Regency Public Works Department uses a method of tracing the irrigation network in each irrigation area (DI), then observes and assesses the condition of the physical infrastructure and then presents the results of the assessment using the Irrigation Network Physical Condition Evaluation form in accordance with PUPR Ministerial Decree No. 12/PRT /M/2015 concerning Exploitation and Maintenance of Irrigation Networks. This form must be conditioned on the management authority of the irrigation area concerned, namely the Irrigation Area under the authority of the central government, provincial regional government and district/city regional government.

Criteria Analysis

Based on observations, the problem with determining irrigation maintenance budget priorities in Sragen Regency is limited funds and assessment criteria. This can be seen in the budget determination in the five irrigation areas which are the objects of research. So far, the determination of the maintenance budget carried out by the Sragen Regency DPU only uses one variable or assessment criterion, namely the level of damage, therefore other criteria are needed that need to be included in the assessment weighting.

Based on the characteristics of the five irrigation areas which are the object of research and a research literature review entitled Analysis of Determining Irrigation Network Maintenance Priorities in Karanganyar Regency Using the AHP (Analytical Hierarchy Process) Method, as well as research entitled Optimization Budgeting Distribution Model for Maintaining Irrigation Scheme, criteria can be determined level of urgency, productivity, service area and cost as weighting assessments in determining priorities [4].[6] .

Analytical Hierarchy Process (AHP)

This AHP stage was carried out by distributing questionnaires to 30 respondents, namely from related parties or agencies such as the Bengawan Solo Center (BBBWS), the Bengawan Solo PSDA Center, Central Java Province, the Food Security, Agriculture and Fisheries Service of Sragen Regency, the Development Planning, Research and Innovation Agency (Bapperida) Sragen Regency, Water Resources Sector, Public Works Service (DPU) Sragen Regency, Field Coordinator in the study area (Gondang, Gemolong and Tangen areas) and Water Resources Consultant. Next, the results of the questionnaire are processed for decision making which includes 4 criteria, namely the criteria for level of urgency, planting productivity, size of irrigation area and costs, then with 5 alternatives, namely DI Kedung Song, DI Garut, DI Kedung Duren Winong, DI Karanganom and DI Buduran. In using the AHP method, it will be carried out through several stages as follows:

1. **Provide a code for each criterion and alternative**

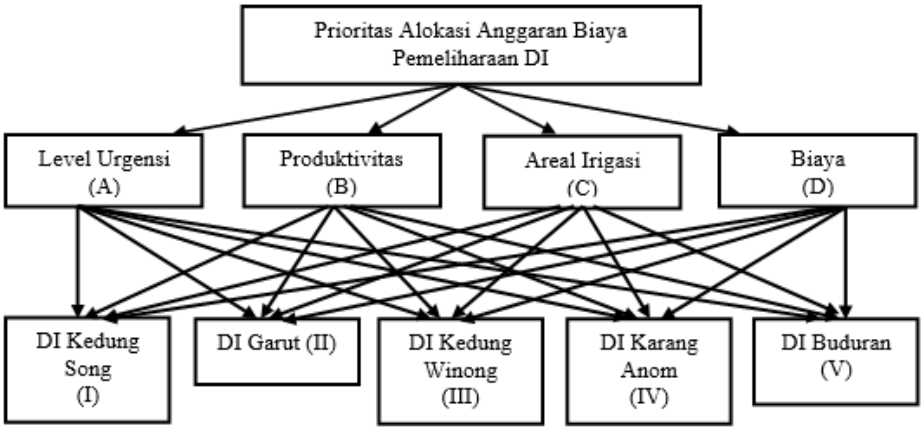

Figure 2 . Hierarchical Structure Code Diagram for Solving Irrigation Area Maintenance Budget Allocation Problems

Respondent Assessment Results

Table 1. Criteria Assessment Results Table

RESP	SKALA PENILAIAN					
	A-B	A-C	A-D	B-C	B-D	C-D
1	9	1/5	5	1/7	7	1/3
2	7	1/5	5	1/7	9	1/3
3	5	5	1/5	7	1/5	1/5
4	1/3	1	1	3	1	1/3
5	5	1/3	3	1/7	1/3	5
6	5	3	1	5	1/5	1/7
7	5	5	1/5	1/5	1/3	1/3
8	5	5	1/3	1/5	1/5	1/3
9	5	5	1/5	1/5	3	1/5
10	5	3	1	1/3	1	1/3
11	3	5	1/5	7	1/3	5
12	3	1/3	3	3	1/3	3
13	3	1/3	3	1	1	1/3
14	1/3	2	1/5	1/5	3	1/7
15	3	1/3	1/3	3	1	1
16	3	5	5	1/3	3	1
17	3	1/3	5	3	1/3	3
18	1/3	3	1/3	3	3	1/3
19	1	5	3	5	5	1/3
20	5	1/9	7	1/7	3	1/3
21	1/7	3	3	5	5	1/3
22	1/5	3	5	5	3	1/3
23	1	1	1/3	1	3	1/3
24	5	3	3	3	3	1
25	3	3	1/5	5	1/3	3
26	5	3	1/3	7	1/3	3
27	1/3	3	1/3	1/7	5	1/3
28	5	7	1/5	1/3	1	3
29	5	3	7	1	1/3	1
30	1	3	1	1/3	1	1
∑ Resp	101,68	81,18	64,40	69,85	64,27	35,35
Resp/30	3,39	2,71	2,15	2,33	2,14	1,18

Table 2. Table of Alternative Assessment Results based on Urgency Level Criteria

RESP	SKALA PENILAIAN									
	I-II	I-III	I-IV	I-V	II-III	II-IV	II-V	III-IV	III-V	IV-V
1	5	1/9	1/2	1/5	3	1/7	1/9	1/3	1/5	1/9
2	1/7	1/3	5	1/5	3	1/9	1/3	1/7	1/5	1/3
3	5	1/5	1/3	1/7	1/7	1/5	1/5	5	1/7	3
4	1/3	1	3	1	1/3	1	3	1	1	1/3
5	1/7	1/3	5	1/3	1/5	1/7	1/5	1/9	3	1/7
6	1/5	3	1/7	1/5	3	3	1/5	1/5	1/5	1/5
7	5	1/5	1/5	1/3	1/3	1/3	1/5	3	3	1/5
8	1/5	5	1/3	1/5	3	1/5	1/3	1/3	1/5	1/8
9	1/5	1/3	1/3	1/5	3	3	1/5	1/5	1/3	1/5
10	1	1/7	1/5	1/3	1/9	1/7	1/5	5	1	1
11	1/2	1/5	5	1/3	1/5	1/7	1/9	1/3	1/5	1/7
12	1/5	1/8	1	3	1/3	1/3	1	3	3	1
13	1/5	1/3	1	3	1/5	1	1/3	3	1/3	1/3
14	1/7	1/7	5	1/7	1/5	1/7	1/3	1/5	1/8	1/5
15	5	1/5	3	1/8	1/3	1	1/3	3	1/3	1
16	1/3	3	1	1/5	1	1	1/7	1/3	3	5
17	1	1/8	1/3	1/7	3	1	1	7	1/5	1/3
18	1/5	1/9	1/3	3	1/9	7	1/7	1/2	1/9	3
19	1	1/5	1/5	1/3	1/7	1/5	1	3	1/5	1/9
20	5	1/9	5	1/7	7	1/9	1/9	1/5	3	1/3
21	1/7	1/7	5	1/3	1/5	5	1/3	7	1/3	1/5
22	1/5	1/7	1/5	1/5	1/7	5	3	2	1/9	1/5
23	1	3	1	1/6	1/3	1	1	1	1/3	1/3
24	5	1/5	3	3	1/3	1/3	1	5	1/6	3
25	1/3	3	3	1/3	5	1	1/4	2	1/7	1/3
26	1/3	5	1/3	1/7	1/5	5	1/3	3	1/7	1
27	1/3	1/5	3	1	1/7	5	1/3	1/8	1/3	1/3
28	3	1/5	1/7	1/5	1/3	1/7	1/5	1/3	1/5	1
29	1	1/7	1/5	1/5	1/7	1/5	1/3	3	1/3	1
30	1	1/3	1/3	1/5	1/5	1/3	1/5	1	1	1/3
∑ Resp	43,14	27,56	53,12	19,34	35,67	43,21	16,47	60,35	22,88	24,83
Resp/30	1,44	0,92	1,77	0,64	1,19	1,44	0,55	2,01	0,76	0,83

Table 3. Table of Alternative Assessment Results based on Planting Productivity Criteria

RESP	SKALA PENILAIAN									
	I-II	I-III	I-IV	I-V	II-III	II-IV	II-V	III-IV	III-V	IV-V
1	7	1/3	1/9	1/3	7	1/5	1/5	1/7	1/7	5
2	3	1/5	5	1/7	3	1/3	1/5	1/7	1/7	1/9
3	1/7	1/5	5	1/9	1/5	5	1/7	5	1/5	5
4	1/3	1/5	3	1	1	1	3	5	3	1/3
5	1/9	1/3	1/5	1/5	1/7	1/3	1/9	1/7	1	1/9
6	1/7	1/5	5	1/9	1/7	5	1/5	1/5	1/6	7
7	5	5	1/3	1/5	1/5	3	1/5	5	1/5	1/5
8	1/5	5	5	1/5	1/3	3	3	1/5	1/5	3
9	1/5	1/5	3	5	1/3	5	1/5	1/5	1/5	3
10	1	1/5	1/3	1/5	1/7	1/5	1/3	3	1/5	1
11	1/5	1/7	1/3	1/5	1/3	1	1/5	1/4	1	1/3
12	1/3	1/3	1/3	1/3	1/5	3	3	1/3	3	1
13	1/3	1/5	3	3	1/3	3	1/3	3	3	1/3
14	3	1/7	5	1/7	1/3	1/7	1/5	1/5	1/7	1/7
15	1/3	1/5	1/3	1/3	1/5	3	3	3	1/3	1/3
16	3	1/5	1/5	1/5	1	1/3	1/7	3	1	1/3
17	1/3	1/7	3	1/3	1/3	4	1	1/7	1/5	1/3
18	1/5	1/5	1/3	1/3	1/5	3	3	5	1/9	3
19	3	1/5	1/5	3	1/7	1/3	1	3	1/5	3
20	1/9	1/5	5	1/7	3	1/7	3	1/9	1/5	1/3
21	1/5	1/7	1/3	1/5	5	5	1/3	1	1/3	1/3
22	1/5	1/7	1/5	1/5	1/7	1/3	3	1/7	1/8	5
23	1	3	1	1	1/3	1/3	1/5	1	1	1/3
24	3	1/3	1/3	1/3	1/5	3	1/3	3	1	1/3
25	1/3	3	1/3	1	1/7	1/7	1/6	5	1/3	1
26	1/3	1/7	1/7	1/5	1/5	3	1/8	1/7	1/7	1/3
27	1/3	1/7	3	1/3	1/5	3	1/3	5	1	1/3
28	1/3	1/5	1/5	1/7	1/3	1	1/5	3	1/5	1/3
29	1	1/5	1/3	1/3	1/5	1/3	1/3	3	1/5	1
30	1	1/5	1/3	1	1/3	1/3	1	1	1	1
∑ Resp	35,71	21,33	50,92	20,26	25,66	57,50	28,49	59,35	19,97	43,90
Resp/30	1,19	0,71	1,70	0,68	0,86	1,92	0,95	1,98	0,67	1,46

Table 4. Table of Alternative Assessment Results based on the Irrigation Area Criteria

RESP	SKALA PENILAIAN									
	I-II	I-III	I-IV	I-V	II-III	II-IV	II-V	III-IV	III-V	IV-V
1	1/9	7	1/7	3	1/7	5	1/5	5	1/3	9
2	3	1/7	1	1/9	5	1/5	1/7	1/3	1/9	1/7
3	5	5	1/5	1/5	1/5	1/5	1	1/5	1/7	5
4	1/3	1/5	1/3	1/3	1	3	1/3	1	1	1
5	3	1/5	1	1/7	5	1/5	2	1/3	1/9	1/9
6	1/7	5	1/5	1/5	1/5	1/7	1/5	1/5	1/5	1/5
7	5	1/3	2	1/5	1/5	1	1/7	1/5	1/5	3
8	3	3	1/5	1/3	1/3	1	1/5	5	1/5	1/3
9	5	5	1/3	1/5	1/5	3	1/7	1/5	1/5	3
10	1	1/7	1/5	1/3	1/7	1/5	1/3	3	1	1
11	1/3	1/9	1/5	1/3	1/5	1	1/5	1	1/5	1
12	1/3	1/5	1/3	1/3	1/3	3	1/3	3	1	1/3
13	1/3	1/5	1/3	1/5	1/5	3	3	1	1/3	1/3
14	1/5	1/9	1/5	1/7	1/7	1/3	1/5	1/7	1/3	1/3
15	1/3	1/5	1/3	1/3	1/5	3	1/3	3	3	1/3
16	3	1/3	1/5	1/5	3	1/5	1	7	1/5	1
17	1/7	1/5	1/4	1/3	1/5	3	1	1	3	1/3
18	1/3	1/5	3	1/3	1/5	1/3	3	5	1/7	3
19	3	1/5	1	3	1/7	1/5	1/3	1/3	1	1
20	1/5	5	1/5	1/7	1/7	7	1/9	3	1/3	3
21	1/3	1/7	1/2	1/3	3	1/3	3	1/5	1/5	1/3
22	1/3	1/5	1/3	1/3	3	3	1/3	5	1/7	1/3
23	1/3	1	3	1	1/3	3	1/3	3	1	1
24	1/3	1/3	1/3	1/3	3	1/5	1	1/3	3	3
25	1/5	1/7	1/4	1/3	1/5	1/5	1/3	3	1/7	1/3
26	1/3	1/7	3	1/5	1/5	5	1	3	1/7	1/3
27	1/3	1/5	1/3	1/3	3	1/3	1/8	1/5	1/5	1
28	1/3	1/7	1/5	1/3	1/5	1	1/3	1	3	1/3
29	1	1/5	1/3	1/5	1/7	1/3	1/5	3	3	1
30	1	1/5	1	1/3	1/5	1	1	1	1/5	1
∑ Resp	38,33	35,48	20,94	14,14	30,46	49,41	21,86	59,68	24,07	42,12
Resp/30	1,28	1,18	0,70	0,47	1,02	1,65	0,73	1,99	0,80	1,40

Table 5. Table of Alternative Assessment Results based on Cost Criteria

RESP	SKALA PENILAIAN									
	I-II	I-III	I-IV	I-V	II-III	II-IV	II-V	III-IV	III-V	IV-V
1	5	1/7	1	1/5	3	1/3	2	1/7	1/9	1/9
2	3	1/9	5	1/7	5	1/7	1/7	1/5	1/9	3
3	1	1/7	1/5	1/5	1/5	1/5	1/4	3	1	1/5
4	1/3	1	1/3	1	1	1	3	1	1	1/3
5	1/9	1/7	3	1/7	1	1/3	5	1/3	1/7	1/9
6	1	1/7	1/5	1/5	1/5	5	1/7	7	1/7	1/5
7	5	3	5	1/5	1/5	1/3	1	3	1/5	1/5
8	1/5	1/5	5	1/4	1/3	1/5	3	5	3	1/5
9	5	5	1/3	1/3	1/5	3	1	1/5	3	3
10	1	1/9	1/7	1/3	1/9	1/7	1/5	1	1/7	1
11	3	1/5	1	1	1	5	7	3	1	1/3
12	1/3	1/5	3	1	1/3	1/3	1/9	1	3	1
13	3	1/5	1	1	1/3	1/3	1/3	3	1/8	1
14	1/5	1/3	1	1/3	1/5	6	5	1/3	1	1/7
15	1/4	1/3	3	3	1/3	1/5	1/3	1/5	3	1
16	3	1/3	3	5	1	7	1/4	3	1/7	3
17	3	3	1/3	1/7	5	1/3	3	7	1/5	1
18	1/3	1/9	1/3	1/3	7	3	1/6	9	1	3
19	1/3	5	3	1	7	5	3	1	1/3	1/5
20	1	1/3	3	1/7	7	1/7	1/7	1/9	1	1/5
21	1/3	1/7	3	1/3	1/7	5	1/5	1/7	5	1/3
22	1/3	1/9	1/3	1/3	1/7	3	3	1/2	1/7	3
23	1	1/3	5	3	1/3	1	1/3	1	1	1/3
24	3	1/3	3	3	1/3	1/3	1	1	4	1
25	1/3	1/7	1/6	1/3	1/7	3	1/3	7	1/7	1/3
26	3	3	1/3	1/5	1/5	1	1	3	1/3	1/3
27	3	3	1/3	1/9	1/3	1/5	1/5	1/3	3	1/3
28	5	1/3	3	1	1/5	1	1/3	5	1/3	1
29	1	1/7	1/5	1/3	1/7	1/5	1/3	1/6	1/5	1
30	1	1/5	1/5	1	1/5	1/3	1/5	1/2	3	1
∑ Resp	54,09	27,78	54,44	25,60	42,62	53,10	42,01	67,16	36,80	27,90
Resp/30	1,80	0,93	1,81	0,85	1,42	1,77	1,40	2,24	1,23	0,93

2. Proving the Consistency of Pairwise Comparison with AHP

Criteria and Alternatives are calculated based on their respective consistency values in the same way. The value used is the cumulative average (Resp/30). In the diagonal matrix AA = BB = CC = DD = 1, because it makes a comparison with its own factors.

Table 6. Initial criteria matrix

Kriteria	A	B	C	D
A	1,00	3,39	2,71	2,15
B	0,30	1,00	2,33	2,14
C	0,37	0,43	1,00	1,18
D	0,47	0,47	0,85	1,00
Total	**2,13**	**5,29**	**6,88**	**6,47**

Table 7. Initial alternative matrix based on urgency level criteria

Kriteria	I	II	III	IV	V
I	1,00	1,44	0,92	1,77	0,64
II	0,70	1,00	1,19	1,44	0,55
III	1,09	0,84	1,00	2,01	0,76
IV	0,56	0,69	0,50	1,00	0,83
V	1,55	1,82	1,31	1,21	1,00
Total	**4,90**	**5,79**	**4,92**	**7,43**	**3,78**

Table 8. Alternative initial matrix based on planting productivity criteria

Kriteria	I	II	III	IV	V
I	1,00	1,19	0,71	1,70	0,68
II	0,84	1,00	0,86	1,92	0,95
III	1,41	1,17	1,00	1,98	0,67
IV	0,59	0,52	0,51	1,00	1,46
V	1,48	1,05	1,50	0,68	1,00
Total	**5,32**	**4,93**	**4,57**	**7,28**	**4,75**

Table 9. Alternative initial matrix based on the criteria of irrigated area

Kriteria	I	II	III	IV	V
I	1,00	1,28	1,18	0,70	0,47
II	0,78	1,00	1,02	1,65	0,73
III	0,85	0,98	1,00	1,99	0,80
IV	1,43	0,61	0,50	1,00	1,40
V	2,12	1,37	1,25	0,71	1,00
Total	**6,18**	**5,24**	**4,95**	**6,05**	**4,41**

Table 10. Initial alternative matrix based on cost criteria

Kriteria	I	II	III	IV	V
I	1,00	1,80	0,93	1,81	0,85
II	0,55	1,00	1,42	1,77	1,40
III	1,08	0,70	1,00	2,24	1,23
IV	0,55	0,57	0,45	1,00	0,93
V	1,17	0,71	0,82	1,08	1,00
Total	**4,36**	**4,79**	**4,61**	**7,90**	**5,41**

The next step is to calculate *the eigenvectors* for each initial matrix of criteria and alternatives.

Table 11. Criteria *Vector* Eigenvalues

Kriteria	A	B	C	D	∑	Wi	E-Vektor
A	1,00	3,39	2,71	2,15	19,687	2,106	0,466
B	0,30	1,00	2,33	2,14	1,472	1,101	0,244
C	0,37	0,43	1,00	1,18	0,187	0,658	0,145
D	0,47	0,47	0,85	1,00	0,185	0,655	0,145
Total	**2,13**	**5,29**	**6,88**	**6,47**	**21,53**	**4,52**	**1,00**

Table 12. Alternative *Vector Eigen Values* based on Urgency Level Criteria

Kriteria	I	II	III	IV	V	∑	Wi	E-Vektor
I	1,00	1,44	0,92	1,77	0,64	1,508	1,086	0,269
II	0,70	1,00	1,19	1,44	0,55	0,654	0,919	0,228
III	1,09	0,84	1,00	2,01	0,76	1,404	1,070	0,265
IV	0,56	0,69	0,50	1,00	0,83	0,161	0,694	0,172
V	1,55	1,82	1,31	1,21	1,00	4,477	1,350	0,335
Total	**4,90**	**5,79**	**4,92**	**7,43**	**3,78**	**6,70**	**4,03**	**1,00**

Table 13. Alternative *Vector Eigen Values* based on Plant Productivity Criteria

Kriteria	I	II	III	IV	V	∑	Wi	E-Vektor
I	1,00	1,19	0,71	1,70	0,68	0,970	0,994	0,245
II	0,84	1,00	0,86	1,92	0,95	1,308	1,055	0,260
III	1,41	1,17	1,00	1,98	0,67	2,166	1,167	0,287
IV	0,59	0,52	0,51	1,00	1,46	0,227	0,744	0,183
V	1,48	1,05	1,50	0,68	1,00	1,600	1,099	0,270
Total	**5,32**	**4,93**	**4,57**	**7,28**	**4,75**	**5,30**	**4,06**	**1,00**

Table 14. Alternative *Vector Eigen Values* based on Irrigation Area Criteria

Kriteria	I	II	III	IV	V	∑	Wi	E-Vektor
I	1,00	1,28	1,18	0,70	0,47	0,497	0,870	0,209
II	0,78	1,00	1,02	1,65	0,73	0,954	0,991	0,238
III	0,85	0,98	1,00	1,99	0,80	1,329	1,059	0,254
IV	1,43	0,61	0,50	1,00	1,40	0,614	0,907	0,218
V	2,12	1,37	1,25	0,71	1,00	2,584	1,209	0,290
Total	**6,18**	**5,24**	**4,95**	**6,05**	**4,41**	**5,48**	**4,17**	**1,00**

Table 15. Alternative *Vector Eigen Values* based on Cost Level Criteria

Kriteria	I	II	III	IV	V	∑	Wi	E-Vektor
I	1,00	1,80	0,93	1,81	0,85	2,585	1,209	0,310
II	0,55	1,00	1,42	1,77	1,40	1,952	1,143	0,293
III	1,08	0,70	1,00	2,24	1,23	2,088	1,159	0,297
IV	0,55	0,57	0,45	1,00	0,93	0,129	0,664	0,170
V	1,17	0,71	0,82	1,08	1,00	0,734	0,940	0,241
Total	**4,36**	**4,79**	**4,61**	**7,90**	**5,41**	**4,90**	**3,91**	**1,00**

The maximum Eigen value is obtained from the initial matrix multiplied by the E-vector of each matrix and then the results of the multiplication are added up. This is also done for all criteria and alternative assessments.

KRITERIA	A	B	C	D		E-Vektor		Eigen
A	1,000	3,389	2,706	2,147		0,466		1,996
B	0,295	1,000	2,328	2,142	X	0,244	=	1,030
C	0,370	0,430	1,000	1,178		0,145		0,593
D	0,466	0,467	0,849	1,000		0,145		0,599
						Total	**=**	**4,219**

Maximum eigen (λmax) = 4.219

Table 16. Results of calculating the maximum eigenvalues for criteria and alternatives

Nilai Eigen Maksimum				
Kriteria	**Alternatif Level Urgensi**	**Alternatif Produktivitas Tanam**	**Alternatif Luas Areal**	**Alternatif Level Biaya**
4,219	5,113	5,231	5,287	5,163

From the results of calculating criteria and alternatives, the following decision tree is created:

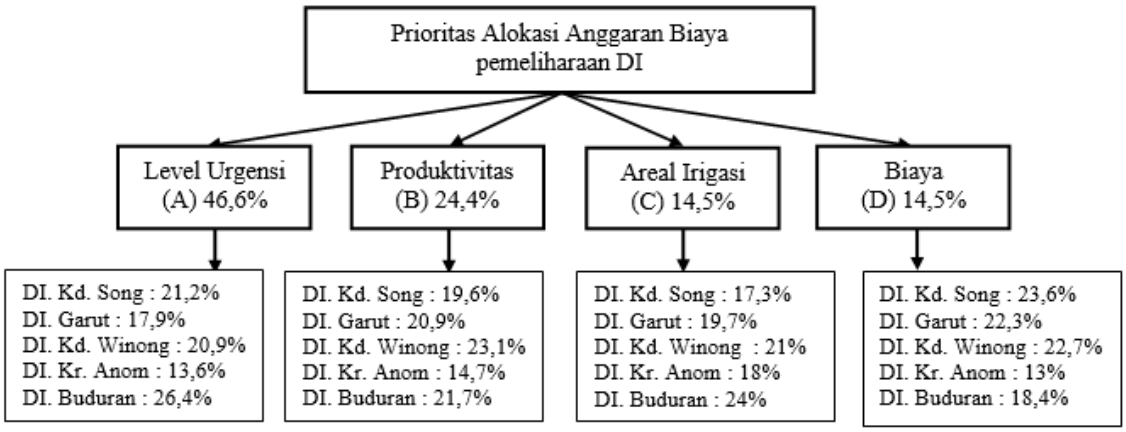

Figure 3. Decision tree resulting from calculation of criteria and alternatives for Irrigation Area Maintenance Budget Allocation

In determining the priority for each Irrigation Area or the value of each alternative, a calculation can be made by multiplying the alternative matrix value by the criteria matrix value as follows:

KRITERIA	E-Vektor Alternatif					E-Vektor Kriteria		Nilai	Bobot (%)
	A	B	C	D					
I	0,212	0,196	0,173	0,236		0,466		**0,206**	**20,6**
II	0,179	0,209	0,197	0,223	X	0,244	=	**0,195**	**19,5**
III	0,209	0,231	0,210	0,227		0,145		**0,217**	**21,7**
IV	0,136	0,147	0,180	0,130		0,145		**0,144**	**14,4**
V	0,264	0,217	0,240	0,184				**0,237**	**23,7**

From the results above, by entering the priority vector value of the reason criteria into the description of the matrix multiplication process, the overall AHP modeling for selecting priorities for irrigation maintenance budget allocation in ranking is:

1. Buduran Irrigation Area with a value of 0.237 (Weight 23.7%)
   Urgency Level: 26.4%, Productivity : 21.7%, Area: 24%, Cost: 18.4%
2. Kedung Duren Winong Irrigation Area with a value of 0.217 (Weight 21.7%)
   Urgency Level: 20.9%, Productivity: 23.1%, Area: 21%, Cost: 22.7%
3. Kedung Song Irrigation Area with a value of 0.206 (Weight 20.6%)
   Urgency Level: 21.2%, Productivity: 19.6%, Area: 17.3%, Cost: 23.6%
4. Garut Irrigation Area with a value of 0.195 (Weight 19.5%)
   Urgency Level: 17.9%, Productivity: 20.9%, Area: 19.7%, Cost: 22.3%
5. Karanganom Irrigation Area with a value of 0.144 (Weight 14.4%)
   Urgency Level: 13.6%, Productivity: 14.7%, Area: 18%, Cost: 13%

Conclusion

Based on the results of the analysis and discussion, it can be concluded that based on the results of the Analytical Hierarchy Process (AHP) calculations, the criteria that have the priority (level) that most influence the priority of irrigation area maintenance budget allocation are Urgency Level 46.6%, Planting Productivity 24.4%, Area Area 14.5%, and Costs 14.5%. These results indicate that the criteria for the level of urgency are more prioritized than the criteria for planting productivity, area and cost. And based on the results of the Analytical Hierarchy Process (AHP) calculation of the overall criteria, a priority percentage was obtained for the budget allocation for maintenance of irrigation areas in 5 DIs in Sragen Regency, namely the Buduran Irrigation Area (DI) at 23.7%, the Kedung Irrigation Area (DI) Duren Winong 21.7%, Kedung Song Irrigation Area (DI) 20.6%, Garut Irrigation Area (DI) 19.5%, Karanganom Irrigation Area (DI) 14.4%.

References

[1] DPUPR Kab. Sragen. (2020). 2020 Performance Report for Irrigation Sector, DPUPERA Kab. Sragen. Sragen.

[2] Sumaryanto, Siregar, M., & Hidayat, D. (2006). Evaluation of Irrigation Network Performance and Improvement Efforts. Center for Socioeconomic Analysis and Agricultural Policy, Department of Agriculture.

[3] Edhisono, SH (2016, January 15). Optimizing Budgeting Distribution Model for Maintaining Irrigation Scheme. Retrieved September 12, 2021, from ejournal undip.ac.id/index.php/ijse: http://ejournal.undip.ac.id/index.php/semnastek.

[4] Sumiyati, D. (2011). Application of Analytical Hierarchy Process (AHP) for Determining Subak Development Strategy. Agritech Journal, 31(2), 87–98.

[5] Supriadi, A., Rustandi, A., Hastuti, D., Komarlina, L., & Ardiani, GT (2018). Analytical Hierarchy Process (AHP): Technique for Determining Competitive Strategy for Embroidery Crafts. Publisher Deepublish (CV Budi Utama Publishing Group).

[6] Republic of Indonesia, Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number: 12/PRT/M/2015 dated 6 April 2015 concerning Exploitation and Maintenance of Irrigation Networks.

[7] Widayanti, R. (2021). Analysis of Determining Irrigation Network Maintenance Priorities in Karanganyar Regency Using the AHP (Analytical Hierarchy Process) Method. Muhammadiyah University Surakarta Postgraduate School. Aldiansyah, M. (2022). Analysis of Impact of Traffic (Andalalin) Transmart Mall Area Jalan Tajur Bogor. *ASTONJADRO: CEAESJ* , Volume 11, pp. 263-274.

[8] Amijaya, J., & Soimun, A. (2022). The Impact of the Construction of the Pertamina Refrigerated LPG Terminal on Traffic Performance on the Surrounding Road Network. *Transportation Journal Vol. 22 No. 2* , 143-154.